

**IN THE UNITED STATES BANKRUPTCY COURT  
FOR THE DISTRICT OF PUERTO RICO**

<p>In re:</p> <p>THE FINANCIAL OVERSIGHT AND MANAGEMENT BOARD FOR PUERTO RICO,</p> <p>as representative of</p> <p>THE COMMONWEALTH OF PUERTO RICO, et al.,</p> <p>Debtor.</p>	<p>PROMESA</p> <p>Title III</p> <p>No. 17 BK 3283-LTS</p> <p>(Jointly Administered)</p>
<p>In re:</p> <p>THE FINANCIAL OVERSIGHT AND MANAGEMENT BOARD FOR PUERTO RICO</p> <p>as representative of</p> <p>PUERTO RICO ELECTRIC POWER AUTHORITY,</p> <p>Debtor.</p>	<p>PROMESA</p> <p>Title III</p> <p>Case No. 17 BK 4780-LTS</p>
<p>THE FINANCIAL OVERSIGHT AND MANAGEMENT BOARD FOR PUERTO RICO,</p> <p>Plaintiff,</p> <p>v.</p> <p>HON. PEDRO PIERLUISI, in his official capacity as Governor of Puerto Rico,</p> <p>Defendant.</p>	<p>Adv. Proc. No. 24-00062-LTS in 17 BK 4780-LTS</p>

**DECLARATION IN SUPPORT OF SENATE'S OPPOSITION TO FOMB'S MOTION  
FOR SUMMARY JUDGMENT**

I, Catherine Kunkel, of legal age, energy consultant with the Institute for Energy Economics and Financial Analysis (IEEFA), and resident of San Juan, Puerto Rico, hereby declare under penalty of perjury that the following is true and correct to the best of my knowledge:

**I. BACKGROUND AND EXPERTISE**

1. I am one of the authors of the study titled “Solar at a Crossroads in Puerto Rico,” published by the Institute for Energy Economics and Financial Analysis in June 2024, attached as Exhibit 1 of this Declaration.
2. The study provides an in-depth analysis of the status, progress, and challenges of solar energy adoption in Puerto Rico, including both rooftop and utility-scale solar projects.
3. I have more than a decade of experience as an energy analyst with IEEFA; I have authored or co-authored numerous studies and expert testimonies related to Puerto Rico’s electrical system, on topics including rates, resource planning, debt restructuring, budgets and fiscal plans, and rooftop solar.

## **II. KEY FINDINGS FROM THE STUDY**

4. The study “Solar at a Crossroads in Puerto Rico” outlines several findings that support the continuation of the net metering program as extended under Act 10-2024:
5. Rooftop Solar is crucial for energy security and resiliency. The widespread adoption of rooftop solar systems by residents and businesses has been pivotal in increasing energy resilience, given both the ongoing instability of Puerto Rico’s grid and the risk of hurricanes. As of March 2024, over 110,000 households had installed rooftop solar, the vast majority with battery backup systems for resiliency.
6. The growth in rooftop solar represents the main area of progress towards Puerto Rico’s renewable energy goals. PREPA and the FOMB have acknowledged the need to reduce reliance on price-volatile fossil fuels to aid in balancing the electrical system budget. Act 17-2019 established a renewable energy target of 40% by 2025. As of June 2024, Puerto Rico was at 9%, up from 2-3% prior to Hurricane Maria. All of this growth had been due to rooftop solar installations.
7. Net metering has been a critical tool for households and businesses seeking to install rooftop solar. The net metering program enables consumers to recover their investments in

solar systems by receiving credits for the excess electricity they export to the grid. As of June 2024, less than 5,000 of the more than 110,000 installed residential rooftop solar systems had benefitted from federal incentives; in other words, more than 95% had been financed entirely by individual households. Reducing or eliminating the net metering compensation would significantly undermine the financial viability of private rooftop solar installations, as highlighted by the rapid decline in new solar installations observed in California following similar policy changes.

8. If the FOMB succeeds in annulling Act 10-2024, the consequences would include: (1) Disruption to the Growth of Solar Energy; (2) Increased Vulnerability to Power Outages; and (3) Failure to Meet Renewable Energy Mandates.
9. The annulment of the net metering extension and possible subsequent reduction in net metering compensation would reduce the financial payback for households and businesses seeking to invest in rooftop solar. This would be a significant setback to the only form of renewable energy that has been expanding rapidly in Puerto Rico.
10. With the grid remaining in a precarious state, rooftop solar has provided critical resilience for many households. Undermining this sector through changes in net metering compensation would increase the vulnerability of residents to ongoing power outages, voltage instability, and the risks of a prolonged blackout following a major storm.
11. Without the extension provided by Act 10-2024, Puerto Rico risks falling further behind its renewable energy targets, delaying the transition away from fossil fuels and missing out on the financial and environmental benefits of increased solar generation.
12. The study recommended that the FOMB incorporate different scenarios of rooftop solar growth in its next fiscal plan. Loss of sales to PREPA from continued adoption of rooftop solar must be planned for and integrated into a complete budgetary context of revenues,


costs and savings initiatives. Unfortunately the FOMB's failure to timely produce an updated fiscal plan for PREPA makes it difficult, if not impossible, to assess this context.

13. In my professional opinion, Act 10-2024 is essential for providing continued access to net metering, which has been a critical tool in facilitating the adoption of rooftop solar, allowing residents and businesses an alternative to Puerto Rico's unreliable electrical system.

14. Annulling Act 10-2024 will put at risk the ongoing growth of rooftop solar, undermining the most successful element of Puerto Rico's energy transition.

15. **I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.**

Date: October 23, 2024

DocuSigned by:  
  
7A8B4A3115054DA...

Catherine Kunkel

# KUNKEL DECLARATION

## EXHIBIT 1

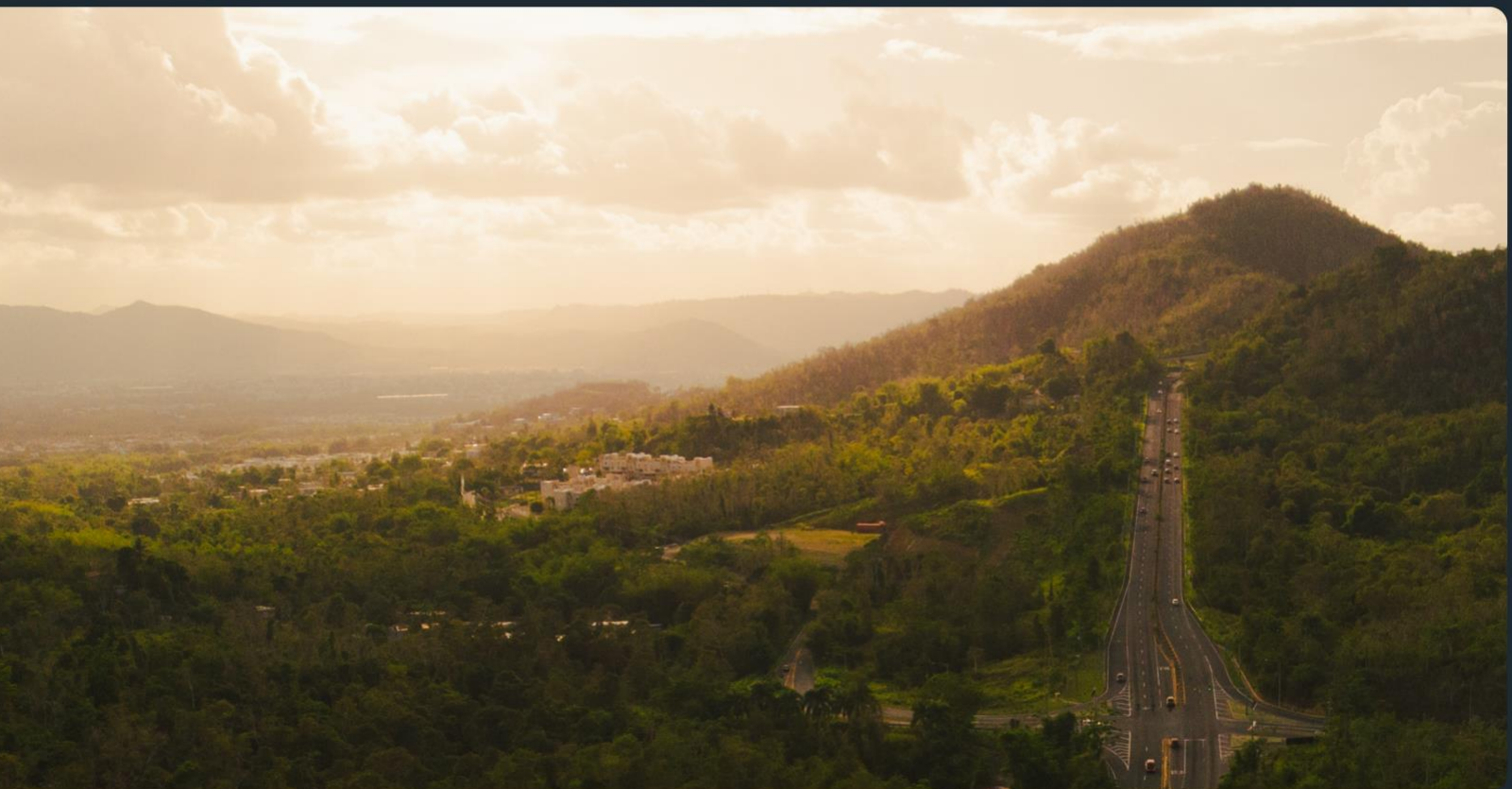


Institute for Energy Economics  
and Financial Analysis

# Solar at a Crossroads in Puerto Rico

Oversight Board, Power Plant Operator Threaten  
Renewable Energy Transformation

Tom Sanzillo, Director of Financial Analysis  
Cathy Kunkel, Energy Consultant



Contents

Key Findings.....3

Executive Summary.....4

Background on Puerto Rico’s Renewable Energy Transition.....6

Status of Rooftop Solar in Puerto Rico.....8

Rooftop Solar and Puerto Rico’s Distribution System ..... 11

FOMB Challenge to Net Metering ..... 12

Federal Programs for Rooftop Solar ..... 13

Summary: Rooftop Solar ..... 18

Status of Solar in Puerto Rico: Utility-Scale Solar ..... 19

Lessons Learned: Utility-Scale Solar ..... 22

About IEEFA ..... 25

About the Authors..... 25

Figures

Figure 1: Grid-Connected Distributed Solar Capacity Installed in Puerto Rico 2014-2024 .....9

Tables

Table 1: Residential, Commercial, Industrial and Farm Rooftop Solar Installations  
as of March 2024 .....8

Table 2: Federal Resources Available to Support Distributed Solar Investments  
in Puerto Rico, 2024 ..... 14

Table 3: Utility-Scale Solar and Storage Procurement Schedule Approved by  
Puerto Rico Energy Bureau ..... 20

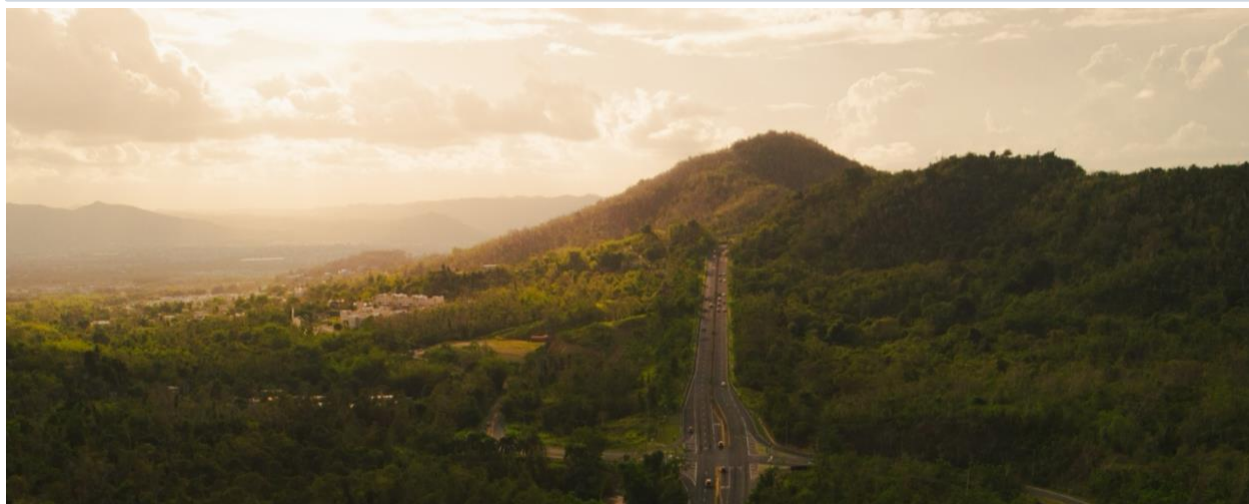
## Key Findings

**Despite an institutional consensus about the importance of renewables for Puerto Rico's power grid, those in charge of day-to-day operation are pursuing aggressive plans for natural gas expansion.**

IEEFA has documented a potential failure to achieve the commonwealth's legislatively mandated renewable energy goals, which call for 40% renewable energy by 2025.

Puerto Rico's renewable energy transformation is well under way, although it is entirely taking place at the level of individual households and businesses installing rooftop solar and storage.

**The FOMB's latest efforts to undermine rooftop solar are an example of poor management and poor planning that could dramatically slow the expansion of renewable energy in Puerto Rico.**





## Executive Summary

Puerto Rico residents and businesses have moved rapidly to install rooftop solar and storage in recent years to improve their resiliency in the face of an unreliable power system. These actions represent a bright spot in the transformation of Puerto Rico's electrical system towards more renewable energy. This report tracks the overall progress of Puerto Rico's long-touted transition to renewable energy—an effort that is behind schedule and plagued by major conflicts of interest.

There is a broad consensus among stakeholders on the need to transition to renewable energy:

- The Financial Oversight and Management Board (FOMB) of Puerto Rico has cited the importance of renewable energy to reduce vulnerability to volatility in fossil fuel prices. The utility cannot emerge from bankruptcy as a going concern with a balanced budget if its enterprise is wedded to the highly volatile operating environment caused by continued reliance on diesel, fuel oil and natural gas.
- In 2020, the Puerto Rico Energy Bureau approved a long-term plan for the utility that calls for a rapid expansion of solar and energy storage on the island. The bureau's orders underscore the concern for affordable and reliable energy.
- The recently released U.S. Department of Energy (DOE) PR100 study attests to the technical feasibility of moving Puerto Rico to 100% renewable energy by 2050.
- The Puerto Rico Legislature, with the support of several governors, has supported the expansion of solar energy. In the island's energy public policy law, Law 17-2019, the legislature acknowledged the urgency of the need for renewable energy expansion and recently made clear that it will continue to support greater investment in the renewable space.

Despite a sustained, multi-tiered institutional consensus that took years to develop, those in charge of the grid's day-to-day operation are pursuing aggressive plans for natural gas expansion. The company in charge of power generation has a business model that is based on the creation, development and expansion of natural gas, utilizing a highly speculative investment strategy. The company, New Fortress Energy, recently told its investors that Puerto Rico's future is natural gas. Recent transactions spearheaded by the company, with the approval of the island government, appear designed to lead to such a result.

The FOMB has also adopted a contradictory set of policies that undermine the expansion of renewable energy. Specifically, the FOMB is taking action to reduce “net metering” compensation, a critically important tool that has supported the widespread adoption of rooftop solar. This payment to customers for excess energy exported to the grid has been essential to the growth of rooftop solar, the only source of renewable energy that has been rapidly growing in Puerto Rico.

The Puerto Rico Electric Power Authority (PREPA) has embarked on a plan to develop new utility-scale solar energy, as mandated by the Puerto Rico Energy Bureau. Although initiated in 2020, no solar power generation has been installed under the utility-scale plan to date. The effort has been hampered by poor management and cost pressures.

This report documents a failure to achieve the commonwealth's legislatively mandated renewable energy goals, which call for 40% renewable energy by 2025. Puerto Rico's need to expand its renewable energy supply (which currently accounts for 9% of consumption) is widely accepted by the island's residents, who are installing solar panels to provide resiliency in the face of the island's dangerously unstable power system. Almost seven years after Hurricane Maria, Puerto Rico's grid remains antiquated and unable to provide reliable service. As documented in this report, tens of thousands of individual households and businesses have been installing solar energy with battery backup for the past seven years, largely without the benefit of any direct subsidies, to have a reliable supply of electricity. This also represents an overwhelming vote of no confidence in the managers of the electrical system.

IEEFA offers a series of recommendations that can help to remedy some of the issues identified in this paper:

- PREPA should cancel its contract with Genera (a subsidiary of New Fortress Energy) as operator of PREPA's power plants.
- The FOMB should allow the new Puerto Rico law to stand, extending net metering through 2030.
- The FOMB should consider several future forecasts of rooftop solar growth in its next fiscal plan to analyze and plan for the budgetary implications of different growth trajectories.
- The DOE should target future federally funded programs for rooftop solar and storage specifically for the most vulnerable households and support standardized, smaller systems to stretch federal dollars farther.
- The Puerto Rico Energy Bureau should track and publish metrics related to voltage stability at the distribution system level.
- LUMA, the private operator of Puerto Rico's transmission and distribution grid, and the Puerto Rico Energy Bureau should publish up-to-date information on the hosting capacity of the distribution system and prioritize increasing hosting capacity where needed, ideally using available federal funds. Customers should not be responsible to pay for distribution system upgrades needed to integrate additional rooftop solar.
- The Energy Bureau should carry out a planning process, with ample community participation, for siting future utility-scale renewable energy projects, and all future procurement tranches should exclude protected agricultural lands and prioritize landfills, brownfields and degraded lands.
- An Independent Private Sector Inspector General (IPSIG) should be established to investigate the delays and cost overruns in the first group of solar projects approved by the Energy Bureau, and to make transparent, public recommendations for current and future procurement processes.

## Background on Puerto Rico's Renewable Energy Transition

Puerto Rico's electricity system has long been dominated by fossil fuels—oil, coal and increasingly natural gas. The combination of fuel and purchased power (from private coal and natural gas plants) has historically been the electrical system's single largest and most volatile expense. In fiscal year 2023, for example, fuel and purchased power accounted for 71% of electrical system expenses.<sup>1</sup>

At a policy level, both the Puerto Rican government and FOMB have recognized the importance of transitioning to renewable energy to reduce expenses and help bring budgets into balance. The price stability that renewable energy would provide is critical to balancing the electrical system's budget. Seven years after establishment of the FOMB, PREPA still does not have a balanced budget.<sup>2</sup> Also, a review of the agency's monthly cash statements suggests the agency has been experiencing ongoing cash flow problems for the last several years—in other words, it has been dealing with an ongoing unbalanced budget by burning through cash.<sup>3</sup>

The FOMB has recognized the importance of renewable energy to reduce Puerto Rico's exposure to fuel price volatility, noting that a spike in global oil prices drove rates from 16 cents per kilowatt-hour (kWh) in October 2020 to more than 35 cents/kWh in October 2022.<sup>4</sup> The utility's fiscal plan certified by the FOMB in June 2023 assumes a significant growth in renewable energy.

In 2010, the Puerto Rico Legislature established a renewable portfolio standard that called for 12% renewable energy by 2015 and 15% by 2020.<sup>5</sup> Not having attained the 2015 goal and or the 2020 objective, the legislature updated the standards in 2019 to call for 20% by 2022, 40% by 2025, 60% by 2040 and 100% by 2050.<sup>6</sup> A recent study from the DOE, PR100, emphasized the technical feasibility of a transition to 100% renewable energy.<sup>7</sup> Yet currently Puerto Rico is at about 9% renewable energy, including rooftop solar and storage, up from 2% to 3% before Hurricane Maria.

---

<sup>1</sup> Financial Oversight and Management Board. [PREPA: FY 23 Monthly B2A Summary](#). August 23, 2023, p. 2. Fuel and Purchased Power as a percentage of total expenses.

<sup>2</sup> U.S. District Court for the District of Puerto Rico, No. 17-04780-LTS (Dkt #4171). [Supplemental Disclosure Statement for Corrected Fifth Modified Third Amended Title III Plan of Adjustment of the Puerto Rico Electric Power Authority](#). November 16, 2023, p. 55.

<sup>3</sup> U.S. District Court for the District of Puerto Rico, No. 17-04780-LTS (Dkt #4883). [Expert Witness Declaration of Tom Sanzillo in Support of Unión de Trabajadores de la Industria Eléctrica y Riego Inc.'s Objection to the Confirmation of Corrected Fourth Amended Title III Plan of Adjustment for the Puerto Rico Electric Power Authority](#). February 26, 2024, pp. 7-9.

<sup>4</sup> FOMB. [FY 2023 Certified Fiscal Plan for the Puerto Rico Electric Power Authority](#). June 23, 2023.

<sup>5</sup> Puerto Rico Act 82-2010 ([Public Policy on Energy Diversification by Means of Sustainable and Alternative Renewable Energy in Puerto Rico Act](#)). July 2010.

<sup>6</sup> Puerto Rico Act 17-2019 ([Puerto Rico Energy Public Policy Act](#)). April 2019.

<sup>7</sup> The PR100 study also included an important and often overlooked finding regarding the short-term cost of improving the reliability of Puerto Rico's generation system, pointing to a much greater level of expense that will be required to bring the generation system up to U.S. reliability standards, whether with renewable energy or fossil fuels). This point highlights the importance of the rooftop solar systems that are providing resiliency now to households not willing to wait for utility-scale investments that may not occur. (See: DOE. [PR100 Study](#). April 2024, p. 230).

Despite the widespread recognition of the importance of renewable energy, the transition has been consistently undermined by competing business models that compromise the public interest. There has been a continual push for more natural gas generation, some of which (proposed natural gas pipelines and a proposed offshore gas port at Aguirre) have been defeated, while others have moved forward. Most recently, PREPA used funding from the Federal Emergency Management Agency (FEMA) to purchase 350 megawatts (MW) of gas-fired temporary generators from natural gas company New Fortress Energy.<sup>8</sup> The generators are supposed to run through the end of 2025, although IEEFA is not aware of any legal reason why this period could not be extended. Similarly, Genera (the subsidiary of New Fortress Energy that was awarded a 10-year contract to operate Puerto Rico's power plants) has been pushing for more power plants to be converted to natural gas, to the benefit of its parent company.<sup>9</sup> Indeed, Genera CEO Brannen McElmurray told investors in May 2024 that "we expect ... the island to be powered simply by natural gas supplemented with solar and battery, and that is going to be Puerto Rico's future."<sup>10</sup> Puerto Rico Gov. Pedro Pierluisi expressed support for the New Fortress plans for greater investment in natural gas.<sup>11</sup> This conflict of interest between the operator of PREPA's power plants and the island's energy public policy represents one of the clearest threats to the growth of solar in Puerto Rico.

FOMB also recently challenged a law approved by the legislature and signed by the governor to extend Puerto Rico's net metering program to 2030, signaling that it favors a reduction in the credit paid to rooftop solar owners who export excess power to the grid. Should the FOMB prevail in this dispute, this would represent a major impediment to the growth of rooftop solar.

This report reviews the current status of Puerto Rico's renewable energy transition, considering both rooftop solar and utility-scale solar, evaluating both progress and obstacles to date.

---

<sup>8</sup> Letter from FOMB to PREPA. [Re: Purchase Contract for Temporary Generators](#). March 15, 2024.

<sup>9</sup> Specifically, Genera is seeking regulatory approval to burn natural gas at the Palo Seco and Mayaguez power plants. Given that New Fortress owns and operates the natural gas import terminal in San Juan (where the Palo Seco plant is located), the natural gas supply contract at least for the Palo Seco plant would almost certainly be awarded to New Fortress. For a more detailed description of New Fortress Energy's business model. See: IEEFA. [New Fortress Energy: Promises to Keep](#). February 2022.

<sup>10</sup> New Fortress Energy. [Q1 2024 Earnings Call](#). May 8, 2024.

<sup>11</sup> El Vocero. [Pierluisi: 'Tenemos Que Velar Porque el Sistema Sea Estable'](#). May 22, 2024.

## Status of Rooftop Solar in Puerto Rico

As of the end of March 2024, there were 813 megawatts of grid-tied rooftop solar installed in Puerto Rico.<sup>12</sup> The following table shows the breakdown between residential, commercial, industrial and farm installations.

**Table 1: Residential, Commercial, Industrial and Farm Rooftop Solar Installations as of March 2024**

	Installed Capacity (kW)	Number of Customers	Average System Size (kW)
Residential	696,000	114,394	6
Commercial	99,000	3,020	33
Industrial	15,000	31	494
Farm	3,000	122	25

Source: LUMA Energy. *Motion Submitting LUMA's Interconnection Progress Report for January through March 2024 and Supporting Materials (Exhibit 3)*. Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0016. April 25, 2024.

The number of residential customers with installed rooftop solar represents almost 10% of households in Puerto Rico, with an average system size of 6 kilowatts.<sup>13</sup> Grid operator LUMA also reports about 95,000 grid-tied battery installations, implying that about 80% of distributed solar installations include battery storage.<sup>14</sup> There are no publicly available statistics for off-grid solar.

Almost all growth has occurred since Hurricane Maria; more than 107,000 customers have installed a grid-tied solar system since September 2017, the vast majority including battery backup.<sup>15</sup> The following figure shows the rapid rise in rooftop solar over the last decade. Rooftop solar presently accounts for 7% of total electricity consumption in Puerto Rico.<sup>16</sup>

<sup>12</sup> By “grid-tied”, we refer to systems that are interconnected to the main power grid, in which excess solar production can be exported to the grid and power can be imported from the grid during hours when the solar system does not produce enough to cover household consumption.

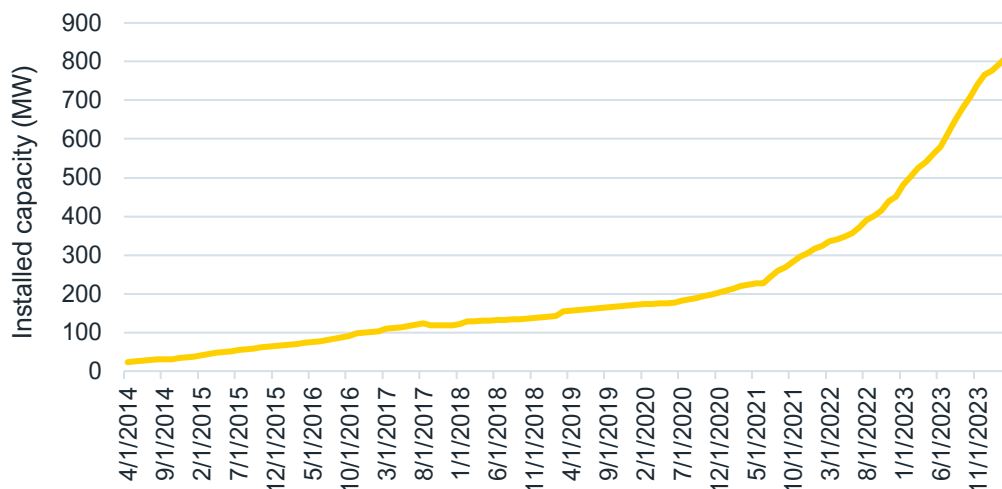
<sup>13</sup> For reference, a 6kW system in Puerto Rico produces about 860 kWh per month, roughly double the monthly consumption of the average household, indicating that solar systems are generally being installed by households with higher consumption.

<sup>14</sup> LUMA Energy. *Resumen-Metricas Master*. Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0007. April 2024.

<sup>15</sup> LUMA Energy. *Motion Submitting LUMA's Interconnection Progress Report for January through March 2024 and Supporting Materials (Exhibit 2)*. Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0016. April 25, 2024.

<sup>16</sup> This assumes a capacity factor of 18% for distributed solar installations. Total electricity sales from the utility (not including self-consumption from rooftop solar installations) were 16,654 GWh. See: LUMA Energy. *Motion Submitting LUMA's Interconnection Progress Report for January through March 2024 and Supporting Materials (Exhibit 1)*. Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0016. April 25, 2024.

**Figure 1: Grid-Connected Distributed Solar Capacity Installed in Puerto Rico 2014-2024**



Source: LUMA Energy. *Motion Submitting LUMA's Interconnection Progress Report for January through March 2024 and Supporting Materials (Exhibit 2)*. Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0016, April 25, 2024.

We estimate that the average upfront cost of a 6kW solar system with lithium-ion battery storage is approximately \$28,500.<sup>17</sup>

All local industry leaders that IEEFA spoke to in the preparation of this report cited the instability of Puerto Rico's electrical grid as the primary driver of residential solar installations. This is borne out by the high percentage of grid-tied systems installed with battery backup; a lithium battery is an expensive investment that is only used to maintain power in the household during an outage and sits idle when the grid is functioning.

Customers are investing in rooftop solar and storage systems not only because of the day-to-day problems with the electrical system but also to have electricity in the event of a prolonged blackout. The resiliency benefit of rooftop solar was demonstrated when Hurricane Fiona caused an island-wide blackout in September 2022. It took eight days to restore service to 60% of customers, and some parts of the island were without power for weeks. However, with few exceptions, residents with solar panels were able to continue receiving electricity from their systems.<sup>18</sup>

Many of these residential solar installations are financed via leases, in which the customer pays a monthly fee for the solar, with little to no upfront cost, and the company guarantees a certain level of production during the term of the contract. Under the leasing model, the financing company owns the system and commits to providing maintenance and replacement parts as needed for 25 years.

According to Energy Information Administration (EIA) data, third-party ownership (leasing) models financed by two companies, Sunnova and Sunrun, accounted for 64,000 solar installations in Puerto

<sup>17</sup> This calculation is based on IEEFA conversations with several industry leaders, assuming market prices of approximately \$2.5/W installed plus \$1/Wh for a 13.5 kWh lithium-ion battery.

<sup>18</sup> Canary Media. *Solar offers lifeline in Puerto Rico after Fiona knocks out power*. September 19, 2022.

Rico as of November 2023, or about 60% of the total.<sup>19</sup> To enter into a lease agreement, potential customers must satisfy a minimum credit score requirement.<sup>20</sup>

As described in greater detail later in this report, both the Puerto Rico Department of Housing and the DOE have financial incentive programs for rooftop solar in Puerto Rico; to date, federal funding has financed almost 5,000 installations.

In some communities, local organizations have facilitated access to solar for the community, but the vast majority of the 117,000 systems installed in Puerto Rico represent decisions of individual home and business owners.

The benefits of rooftop solar have not been distributed equitably. As noted above, the upfront cost of the average solar system installed in Puerto Rico is about \$28,500 if paid in cash. The median household income in Puerto Rico in 2022 was \$24,000, with an average household size of 2.65 persons.<sup>21</sup>

According to an analysis from the Puerto Rico Solar Energy and Storage Association (SESA) shared with IEEFA,<sup>22</sup> more than 71% of solar systems had been installed by households earning more than 80% of the area median income by December 2022. Only 0.1% of systems had been installed by households earning less than 30% of the median income as defined by the U.S. Department of Housing and Urban Development (HUD).<sup>23</sup>

---

<sup>19</sup> EIA. [Form 861M](#). November 2023.

<sup>20</sup> Based on example Sunrun lease provided to IEEFA.

<sup>21</sup> United States Bureau of the Census. [Puerto Rico: Quick Facts](#). Last visited May 24, 2024.

<sup>22</sup> Puerto Rico Solar Energy and Storage Association. Internal Data Compilation provided to IEEFA. Data compilation was derived from LUMA data and zip code-level Census Bureau income data.

<sup>23</sup> The HUD Area median income estimates vary by municipality in Puerto Rico. For a family of three, 80% of the HUD Area median income in 2024 is \$26,550 in San Juan; \$22,000 in the municipality of Ponce; and \$19,900 in the rural municipality of Maricao. See: HUDuser.gov. [Data Sets: Geography 2024](#). Last visited May 2024.



## Rooftop Solar and Puerto Rico's Distribution System

The rapid uptick of distributed solar generation has raised concerns related to the current poor condition and lack of reliability of Puerto Rico's distribution system, and its capacity to absorb more distributed solar without worsening these problems.

Puerto Rico's distribution system is widely known to have problems maintaining voltage stability.<sup>24</sup> Although the Puerto Rico Energy Bureau does not require reporting on statistics related to power quality, the problem of power (voltage) surges destroying household appliances is well known.

In addition, voltages outside the normal range of operations can have a direct impact on the installation and operation of residential solar systems. When an installer conducts a house visit prior to installation, the grid voltage at the house is measured; the installation cannot proceed if the voltage is out of normal operating range. If the inverter (that connects the system to the grid) of an installed system detects that the voltage is outside of its programmed range for more than a couple seconds, it will switch the solar system into islanded mode, meaning that it cannot export electricity to the grid.

Under Puerto Rico's net metering program, customers receive a credit for electricity exported to the grid during the day at the retail rate, which offsets their consumption from the grid at night. If the system cannot export for an extended period, the household loses this economic benefit and essentially ends up paying double: First, for the solar panel to generate excess electricity that it cannot export, then to LUMA to buy electricity at night. There are no reported statistics or tracking of voltage data to be able to quantify the frequency of these occurrences, but both problems were raised by industry leaders in conversations with IEEFA.

Additionally, IEEFA notes that very little work has been done to analyze the hosting capacity of distribution feeders, which carry electricity from the substation to individual homes or businesses. "Hosting capacity" refers to the level of distributed generation that can be added to a distribution feeder before causing voltage or current violations on the feeder.<sup>25</sup> A May 1, 2024, filing by LUMA with the Energy Bureau shows that LUMA has only analyzed the hosting capacity of a tiny fraction of the more than 1,000 distribution feeders in Puerto Rico.<sup>26</sup>

In theory, the addition of battery energy storage by the utility at the distribution system level and/or the use of "smart inverters" in rooftop solar and storage installations can be used to increase the hosting capacity of a feeder. However, given the very limited analysis that has been done of the hosting capacity of individual feeders, the extent of the work that might need to be done to improve hosting capacity is not known.

<sup>24</sup> InterNewsService. [Fluctuaciones en el voltaje del sistema eléctrico de LUMA Energy: desde averías hasta molestos "flickers"](#). August 30, 2022. El Vocero. [Cuestionamiento sobre las fluctuaciones de voltaje](#). October 5, 2023.

<sup>25</sup> Without distributed generation, a feeder provides a one-way flow of power from a transformer to the houses or businesses. When distributed generation is present, it is injecting power onto the feeder, which can result in overloading the feeder.

<sup>26</sup> LUMA Energy. [Motion to Submit Updated Implementation Plan in Compliance with Resolution and Order of April 11, 2024](#). Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0011. May 1, 2024, p. 12.



IEEFA notes that current interconnection regulations leave the customer responsible for the cost of any distribution feeder upgrades that may be required if the integration of their system to the grid would lead to voltage or thermal violations (i.e., voltage or current outside of operating limits). The distribution system operator is supposed to evaluate new interconnection applications (including net metering applications) to determine if they require grid upgrades. This analysis was largely not done until recently; LUMA reported to the Energy Bureau in May 2024 that it had just completed the backlog of 35,000 studies and determined that about 300 distribution system modifications are retroactively required for systems that have already been interconnected (including upgrades to service transformers, switches, distribution line segments and capacitor banks). LUMA stated that it would verify the results of its studies in summer 2024, then propose mechanisms to start charging customers for the cost of the upgrades.<sup>27</sup>

## FOMB Challenge to Net Metering

Recently, the FOMB has challenged a new Puerto Rico law to extend net metering to 2030.

Puerto Rico law had originally established that net metering would remain in place until 2024, when the Energy Bureau was supposed to produce a study evaluating its costs and benefits and, based on this study, could choose to modify the net metering compensation. The island's legislature and governor approved an extension of net metering in its current form, deferring the Energy Bureau's study until 2030.<sup>28</sup>

Under PROMESA (the 2016 federal law that established the oversight board), the FOMB has broad powers to challenge commonwealth laws that are inconsistent with FOMB-approved fiscal plans and can seek to have laws overturned in court. The FOMB has determined that the new law is inconsistent with the 2023 PREPA fiscal plan, which had incorporated the plans for a study in 2024 and argued that the net metering compensation should be reduced, although the plan did not provide any evidence to support this view.

The governor's party has insisted in the legislature that it will not introduce a measure in 2024 to revoke the new law.<sup>29</sup> The next step from the FOMB would be to take the matter to court with the intention of having the law overturned.

If the FOMB prevails and if the Energy Bureau decides to significantly reduce the compensation rate under net metering, this would have a major impact on the market. California provides a valuable warning lesson. In 2022, California had 8% penetration of distributed solar, similar to Puerto Rico's current figure. California reformed its net metering compensation structure, reducing compensation by between one-third to one-half the retail rate; this change took effect in April 2023. New

<sup>27</sup> [Puerto Rico Energy Bureau Technical Conference in Case No. NEPR-MI-2019-0016, Part II](#), May 6, 2024 (22-32 minutes).

<sup>28</sup> [Puerto Rico Act 10-2024 \(Law to Amend Articles 4 and 9 of Act 114-2007, as amended, known as the 'Puerto Rico Electric Power Authority Net Metering Law' in order to reformulate the timeline to perform a study on net metering and distributed energy, and for other ends\)](#), January 2024.

<sup>29</sup> Metro Puerto Rico. [Delegación del PNP en la Cámara no radicará ni aprobará legislación para derogar ley sobre medición neta](#), May 17, 2024.

installations fell by 66% to 83% across different utility service territories in the first five months after the policy took effect.<sup>30</sup> Such an outcome would represent a major setback to the only form of renewable energy that has been growing in Puerto Rico and would further delay the island's renewable energy transition.

## Federal Programs for Rooftop Solar

Approximately \$2 billion from different federal funding streams—disaster recovery funds awarded after Hurricanes Irma and Maria in 2017; disaster mitigation funds; COVID-19 relief funds; the Environmental Protection Agency's (EPA) "Solar for All" program; and a \$1 billion congressional allocation specifically for solar in vulnerable communities in Puerto Rico—has been or is in the process of being deployed to support rooftop solar and storage in Puerto Rico. Depending on the funding stream, the programs have different audiences, although the majority of funding has been aimed at lower income and vulnerable households. The following table summarizes these programs.<sup>31</sup>

<sup>30</sup> Canary Media. [California rooftop solar policy is killing its rooftop solar industry](#). December 1, 2023.

<sup>31</sup> In addition to the funds described in the table, \$1.3 billion of CDBG-DR funds were allocated for an "Energy Electrical Power Reliability and Resilience Program." The funding is split between "strategic projects" as determined by the Puerto Rico Department of Housing and a competitive project solicitation, which closed in January 2024. The solicitation, which had a minimum award of \$5 million, was open to microgrids and other larger decentralized solutions. As of the publication of this report, the winning projects have not been announced. This minimum project size is very difficult for many local non-profit organizations. The Department of Housing extended the deadline for the bidding process, allegedly because of difficulty attracting bids.

**Table 2: Federal Resources Available to Support Distributed Solar Investments in Puerto Rico, 2024**

Program	Allocated Funding	Program Launch	Eligibility	Technical Specifications	Number of Systems Installed	Number of Systems Planned	Agency in Charge
Community Energy and Water Resilience Installations Program (a)	\$395 million Community Development Block Grant – Disaster Recovery (CDBG-DR)	Nov. 2021	Homes part of the PR Department of Housing's R3 program for housing reconstruction after Hurricane Maria	Installation of water cistern and standardized solar system of 3 or 4.3 kW solar with 9 or 12.8 kWh of storage	3,606, as of April 2024 (b)	6,406 active applications (b)	Puerto Rico Department of Housing
New Energy PR (c)	\$350 million Community Development Block Grant – Mitigation (CDBG-MIT)	Mar. 2023 (Round 1), Jan. 2024 (Round 2)	Below 30% of HUD area median income (Round 1); below 80% of HUD area median income (Round 2) (d)	100% of cost (up to \$30,000) of a grid-tied rooftop solar and battery system, or the addition of batteries to an existing PV system	382, as of Dec. 2023 (e)	9,000 (3,000 from Round 1, 6,000 from Round 2)	Puerto Rico Department of Housing
Solar Incentive Program (f)	\$100 million CDBG-MIT	Aug. 2023	Up to 200% of HUD area median income, and household already had to have a contract (with no installation work done) with a solar company (d)	30% of cost (up to \$15,000) for rooftop solar systems with storage	631, as of Feb. 2024 (g)	6,000	Puerto Rico Department of Housing
Energy Support Incentive Program 1.0 (h)	\$20 million American Rescue Plan Act	Dec. 2021	Small/medium enterprise with an average sales value of \$5 million or less	Up to \$25,000 for solar and storage systems, energy efficiency, and/or EV charging infrastructure	unknown	unknown	Puerto Rico Department of Commerce and Economic Development
Energy Support Incentive Program 2.0 (i)	\$30 million CDBG-DR	Not yet launched	Small/medium enterprise with an average sales value of \$5 million or less and that provide services in industries critical in the event of a natural disaster (food service, gasoline, agriculture, etc)	60% of project cost up to \$50,000 for renewable energy and storage and/or electric vehicle charging	NA	unknown	Puerto Rico Department of Commerce and Economic Development

Energy Resilience Fund Solar Access Program (j)	Up to \$400 million	Nov. 2023 (3 contractors selected)	Households that are currently enrolled in at least one federal assistance program (LIHEAP, NAP or TANF), own their home and either (a) are located in a high-priority area (identified based on percentage of very low-income residents and frequency/duration of power outages), or (b) have a household member that relies on electricity for a medical condition or disability	Homeowner pays zero upfront cost, ongoing lease payment to company that maintains system for 25 years	none	30-40,000 (combined with below program)	U.S. Department of Energy
Energy Resilience Fund (j)	Up to \$40 million	Nov. 2023 (5 non-profit awardees selected)	Households that are currently enrolled in at least one federal assistance program (LIHEAP, NAP or TANF), own their home and either (a) are located in a high-priority area (identified based on percentage of very low-income residents and frequency/duration of power outages), or (b) have a household member that relies on electricity for a medical condition or disability	Rooftop solar and storage systems (specifications are project-dependent, each organization selected has a different model)	none	30-40,000 (combined with above program)	U.S. Department of Energy
Energy Resilience Fund (k)	\$650 million	Not yet launched	NA	NA	NA	NA	U.S. Department of Energy
Solar for All (l)	\$156.1 million EPA funds	Not yet launched	NA	NA	NA	17,000	Puerto Rico Office of Management and Budget in partnership with other local agencies

- (a) Puerto Rico Department of Housing. [CDBG-DR Program Guidelines: Community Energy and Water Resilience Installations \(CEWRI\) Program](#). Version 5. January 26, 2024.
- (b) Puerto Rico Department of Housing. [Community Energy and Water Resilience Installations Program Dashboard](#). Last updated April 1, 2024. Accessed April 22, 2024.
- (c) Puerto Rico Department of Housing. [CDBG-MIT Program Guidelines: Home Energy Resilience Improvements and Incentive Subprograms](#). Version 1. January 13, 2022.
- (d) The HUD Income Limits for CDBG programs in Puerto Rico differ substantially from the actual median household income as determined by the U.S. Census. For a family of three in FY 2024, 30% of the HUD area median income is \$16,850; 80% of the HUD area median income is \$44,950; and 200% of the HUD area median income is \$112,400. See Puerto Rico Department of Housing. [CDBG-DR Documents and Federal Resources](#). Accessed May 24, 2024.
- (e) El Vocero. [Instaladas apenas 16% de placas solares con fondos federales bajo Vivienda](#). January 12, 2024.
- (f) Puerto Rico Department of Housing. [Solar Incentive Program](#). Accessed May 24, 2024.
- (g) Marielis Acevedo. [Programa federal Nueva Energía para placas solares en Puerto Rico: secretario de Vivienda explica por qué boletos se acabaron en minutos](#). El Diario. February 15, 2024.
- (h) Government of Puerto Rico. Fondo Estatal de Recuperación Fiscal del Coronavirus. [Programa Incentivo Energético: Guías del Programa](#). Accessed May 24, 2024.
- (i) Puerto Rico Department of Economic Development and Commerce. [Energy Support Incentive Program 2.0 Set-Aside: Program Guidelines](#). November 28, 2023.
- (j) DOE. [Puerto Rico Energy Resilience Fund](#). Accessed May 24, 2024. DOE. [Fact Sheet: Puerto Rico Energy Resilience Fund](#). November 2023.
- (k) The DOE has not announced how it will deploy the remainder of its \$1 billion in funding in a second phase.
- (l) NotiCel. [Asignación de \\$156 millones permitirá la conexión a la energía solar en miles de hogares en la isla](#). April 22, 2024.

The federally funded programs have facilitated the installation of almost 5,000 residential systems. IEEFA was unable to find information on the number of commercial installations completed through the Puerto Rico Department of Commerce and Economic Development's Energy Support Incentive 1.0 Program, although it would be fewer than 800 if all customers received the maximum award. We estimate that 95% of the approximately 117,000 rooftop solar systems installed in Puerto Rico to date have been installed without federal aid.<sup>32</sup>

As noted in the table, deployment has not yet started for the Energy Support Incentive 2.0 Program, the DOE programs, or for the recently announced EPA Solar for All program. If all federally funded programs reach their goals, they will facilitate the installation of almost 120,000 systems.<sup>33</sup> IEEFA notes that this is a very rough estimate that is likely an overestimate, given the very slow rollout of the Puerto Rico Department of Housing's New Energy and Solar Incentive programs<sup>34</sup> and the lack of track record to date for the DOE and EPA programs. Additionally, the FOMB's challenge to net metering would reduce the economic benefit to households from the DOE's program and could potentially result in a decision to increase the federal benefit per household, reducing the number of households served.

One way to put the potential 120,000 systems in context is to recall that Hurricane Maria left one-third of PREPA customers (about 450,000 households) without power for more than three months (in many cases, significantly longer).<sup>35</sup> The Puerto Rico power grid today is in similar or worse condition than it was before Hurricane Maria, in terms of basic reliability metrics.<sup>36</sup>

Another relevant data point comes from a 2021 National Renewable Energy Laboratory study that estimated that Puerto Rico has almost 1.1 million residential buildings that are suitable for solar, of which 510,000 are low- and moderate-income (defined as up to 80% of area median income).<sup>37, 38</sup> According to the analysis by the Puerto Rico Solar Energy and Storage Association, only about 30% of these households (150,000) are likely to install solar on their own, a number that will be reduced if net metering is weakened. That leaves more than 350,000 low- and moderate-income households without a basic level of resiliency to future storms and blackouts.

<sup>32</sup> As stated above, Puerto Rico Department of Housing funds have installed 3,261 systems under the Community Energy and Water Resiliency Installations Program and 382 systems under the New Energy Program.

<sup>33</sup> This assumes that the remainder of the DOE funding is deployed similarly to the first round, so that a total of about 80,000 households are affected by the \$1 billion in DOE funds.

<sup>34</sup> Puerto Rico Department of Housing. [New Energy Program](#). Visited May 24, 2024.

<sup>35</sup> Marcel Castro-Sitiriche, Yonatan Cintrón-Sotomayor, Jonathan Gómez-Torres. [The Longest Power Blackout in History and Energy Poverty](#). Proceedings of the 8<sup>th</sup> International Conference on Appropriate Technology. November 2018.

<sup>36</sup> LUMA reports a 12-month rolling average SAIDI (System Average Interruption Duration Index) of 1414 minutes per year and SAIFI (System Average Interruption Frequency Index) of 8 interruptions per year. See: LUMA Energy. [Resumen Métricas Master](#). Puerto Rico Energy Bureau Case No. NEPR-MI-2019-0007. April 2024. In 2016, consultants to the Energy Bureau reported SAIFI of 5.4 interruptions per year and SAIDI of 960 minutes per year. See: Fisher and Horowitz. [Expert Report](#). Puerto Rico Energy Bureau Case No. CEPR-AP-2015-0001. November 2016.

<sup>37</sup> The NREL study used HUD area median income limits, which are distinct from the HUD income limits used for the CDBG programs. The HUD area median income estimates vary by municipality in Puerto Rico. For a family of three, 80% of HUD area median income in 2024 is \$26,550 in San Juan; \$22,000 in the municipality of Ponce; and \$19,900 in the rural municipality of Maricao. See: HUD. [HUDuser.gov](#). Visited May 2024.

<sup>38</sup> Megan Mooney and Katy Waechter. [Puerto Rico Low to Moderate Income Rooftop PV and Solar Savings Potential](#). National Renewable Energy Laboratory. December 17, 2020.

Given the widespread need for the resiliency provided by rooftop solar and storage, it is important that programs be carefully designed and targeted to maximize their impact. So far, the federally funded programs have a mixed track record. For example, the Puerto Rico Department of Housing's Solar Incentive program, which provided incentives for households with incomes of as much as \$108,000 (for a family of three), was not well-targeted to benefit households that could not otherwise install solar on their own. The Department of Housing's New Energy program, which provided as much as \$30,000 to cover the cost of a system, provides installers an incentive to over-design a system to recover the full incentive payment even if a household does not need a system of that size.<sup>39</sup> Additionally, the second round of that program provided systems free of charge to households with incomes of as much as \$43,200 (for a family of three), well above the median income in Puerto Rico. On the other hand, if it is implemented as planned, the DOE's Solar Access Program will reach a significantly greater number of households than the New Energy program (per dollar of funding allocated), by virtue of not giving systems away for free. The Solar Access Program is also more specifically targeted to low-income households that are in regions with particularly unreliable electricity service and/or depend on medical devices that require electricity.

IEEFA also notes that all the federal programs are aimed at covering a household's full energy consumption. This constricts the families' choice, potentially burdening the household budget with unneeded costs (in cases where the program includes participant cost-sharing) and reduces the ability of the program to reach out to a higher number of households. Given the choice, a consumer might elect to cover only critical needs (such as a refrigerator, any medical equipment and basic lighting).

Finally, it appears that the majority of the federal programs have not been designed with much consideration of their impact on market structure and have tended to favor larger installers. This is particularly the case with the DOE's Solar Access Program, which chose three large installers to deploy \$400 million. In contrast, the much smaller Department of Commerce and Economic Development's Energy Support Incentive Program 1.0 (a \$20 million program) chose to support small installers by only permitting solar and energy efficiency providers that were small or medium-sized businesses to participate as contractors in the program.<sup>40</sup>

<sup>39</sup> One of the installers that IEEFA spoke with pointed out that the reimbursement to installers included a significant profit margin, giving installers the incentive to aim for a full \$30,000 project even if this resulted in an over-designed system.

<sup>40</sup> Specifically, eligible contractors had to have an annual sales volume of less than \$5 million, according to the program guidelines. See: Government of Puerto Rico. [Fondo Estatal de Recuperación Fiscal del Coronavirus. Programa Incentivo Energético: Guías del Programa](#). Last visited May 24, 2024.

## Summary: Rooftop Solar

The extremely rapid growth of rooftop solar and storage in Puerto Rico marks a bright spot in the island's energy transformation. For the last two years, the number of installed systems has grown 60% to 70% per year. More than 110,000 households have greatly improved their resiliency as Puerto Rico heads into what is forecasted to be one of the most active Atlantic hurricane seasons on record in 2024.

These benefits have been very unevenly distributed; in the absence of federal programs, only 0.1% of very low-income households were able to obtain a rooftop solar system. To date, federal programs have resulted in the installation of almost 5,000 residential systems; if implemented according to plan, they could reach as many as 120,000 households by IEEFA's estimate. However, IEEFA notes that many of these programs are untested and haven't produced results. Implementation also has historically been challenging in Puerto Rico and will be even more difficult if the FOMB succeeds in weakening the island's net metering policy.

IEEFA also notes that the instability of the electric grid, widely cited as a major motivation for the rapid growth of rooftop solar, can also be a hindrance to the greater penetration of rooftop solar and storage. There is a lack of transparency both around the existing hosting capacity of the grid (amount of distributed generation that can be supported under current grid conditions) and around the extent to which FEMA funds or other resources are being deployed to resolve power quality issues and increase hosting capacity. It also appears likely that in the next several months, some customers will start to receive notifications that they need to pay for upgrades to their local distribution system that should have been done when their system was interconnected. This method of charging individual customers for modifications that will benefit all the customers on a feeder (including those that might install solar in the future) needs to be revisited, especially given the availability of federal funds that could conceivably be used for this purpose.

Finally, IEEFA notes that LUMA has a financial disincentive to prioritize the transition to a decentralized grid. LUMA faces strong pressure to stay within budget, and reduced sales resulting from increased distributed generation would imply lost revenue to LUMA.



## Status of Solar in Puerto Rico: Utility-Scale Solar

There are powerful incentives for the government of Puerto Rico to prioritize the addition of utility-scale solar. Like distributed solar, utility-scale solar has the potential to provide significant generation capacity. The recently released PR100 study found that the technical potential for utility-scale solar on non-agricultural and non-ecologically sensitive lands (as defined by the Puerto Rico Planning Board) is 14,000 megawatts (compared to currently installed capacity of 235 megawatts).<sup>41,42</sup> Like distributed solar and storage, utility-scale solar and storage support the retirement of the island's coal, oil and natural gas power plants. Given that fuel has historically been the largest and most volatile element of PREPA's budget, elimination of this volatility should contribute to the fiscal goals of a balanced budget. On the other hand, it is important to point out that utility-scale solar (like other forms of centralized generation) does not provide the same resiliency benefits as distributed solar because customers obtain the electricity generated via the transmission and distribution network, which may collapse during a severe storm.

Despite these incentives, the expansion of utility-scale solar has stalled. In sharp contrast to the growth of distributed solar, Puerto Rico has yet to generate a single additional megawatt of utility-scale solar since Hurricane Maria.

The current 235 megawatts of utility-scale renewable energy capacity were installed by private developers with power purchase contracts that were signed in the early 2010s at prices significantly above market rates, through processes that the Puerto Rico Department of Justice later characterized as irregular and politically influenced.<sup>43</sup> PREPA is currently purchasing power under these contracts at approximately 16 cents/kWh, just barely below the average cost of generation of 17 cents/kWh.<sup>44</sup>

In August 2020, the Puerto Rico Energy Bureau approved the following schedule for utility-scale renewable energy and battery storage procurement, as part of PREPA's integrated resource plan:

---

<sup>41</sup> DOE. [PR100 Study](#). April 2024, p. 181.

<sup>42</sup> According to PREPA's June 2019 Integrated Resource Plan (filed with the Puerto Rico Energy Bureau. Case No. CEPR-AP-2018-0001).

<sup>43</sup> Centro de Periodismo Investigativo. [Fracasa la fiebre privatizadora de Luis Fortuño mediante contratos de energía renovable](#). March 2018.

<sup>44</sup> FOMB. [FY 2023 Certified Fiscal Plan](#), p. 40.



**Table 3: Utility-Scale Solar and Storage Procurement Schedule Approved by Puerto Rico Energy Bureau**

RFP Target Release Date	Procurement Tranche	Solar PV or equivalent other energy, MW		4-hr. Battery Storage equivalent, MW	
		Minimum	Cumulative	Minimum	Cumulative
Dec-20	1	1000	1000	500	500
Jun-21	2	500	1500	250	750
Dec-21	3	500	2000	250	1000
Jun-22	4	500	2500	250	1250
Dec-22	5	500	3000	125	1375
Jun-23	6	750	3750	125	1500

Source: Puerto Rico Energy Bureau. *Final Resolution and Order on the Puerto Rico Electric Power Authority's Integrated Resource Plan*, p. 268.

As of April 2024, 807 megawatts of solar PV contracts had been executed and approved by the FOMB. This includes 12 projects adjudicated under Tranche 1 referred to in the above table and one project (Ciro One, 140 MW) that was approved under previous negotiations with solar providers.<sup>45</sup> The *Ciro One* project has been constructed but is not yet operational.<sup>46</sup> Some of these solar projects also include on-site battery storage.

In addition, five contracts for utility-scale storage totaling 350 megawatts of four-hour storage were approved by the FOMB in October 2023.<sup>47</sup> In April 2024, PREPA informed the Energy Bureau that it was proposing to increase the size of two projects by 85 megawatts.<sup>48</sup> In May 2024, PREPA informed the Energy Bureau that it had signed two additional energy storage contracts.<sup>49</sup>

As can be seen from the table above, the Tranche 1 process has taken significantly longer than initially planned and resulted in contracts for less capacity than originally anticipated. In October 2021, the Energy Bureau, recognizing the failure to meet performance targets, decided to hire an independent coordinator (instead of PREPA) to manage the bidding processes for the remaining tranches.<sup>50</sup> Yet as of April 2024, there had been no public information on the results of subsequent tranches. According to the website of Accion Group, the Energy Bureau's independent coordinator, the Tranche 2 bidding process opened on Sept. 28, 2022, and closed on December 5, 2022, and interconnection studies for selected projects were supposed to be completed by Aug. 7, 2023. The latest announcement posted by Accion Group regarding Tranche 2, dated September 28, 2023, was

<sup>45</sup> PREPA negotiated 16 renewable energy power purchase and operating agreements (PPOAs) between 2018 and 2020, all of which were rejected by the FOMB, but the oversight board allowed PREPA to move forward with developing 150 megawatts of projects. The *Ciro One* project is the result of this process. See: FOMB letter to PREPA. *Re: Tranche 1 RFP PPOAs*. September 14, 2023.

<sup>46</sup> PREPA. *Motion to Present Monthly Progress Report for May 2024*. Puerto Rico Energy Bureau Case No. NEPR-MI-2021-0001. April 30, 2024.

<sup>47</sup> FOMB letter to PREPA. *Re: Tranche 1 Energy Storage Agreements*. October 16, 2023.

<sup>48</sup> PREPA. *Motion to Submit Amendments for Two Executed ESSA's*. Puerto Rico Energy Bureau Case No. NEPR-MI-2020-0012. April 16, 2024.

<sup>49</sup> PREPA. *Motion to Submit Additional Energy Storage Service Agreements (ESSAs) for the Energy Bureau's Approval*. Puerto Rico Energy Bureau Case No. NEPR-MI-2020-0012, May 7, 2024.

<sup>50</sup> Puerto Rico Energy Bureau, Resolution and Order. *Case No. NEPR-MI-2020-0012*. October 29, 2021.

that “a date for best and final offers has not yet been established for Tranche 2 bids.” Regarding Tranche 3, the latest announcement was posted on August 24, 2023, and stated that bids were due September 1.<sup>51</sup>

In its September 2023 contract review, the FOMB attributed delays in the Tranche 1 process to PREPA’s poor communications with the Energy Bureau; LUMA’s slowness in conducting system impact studies; LUMA’s policy changes regarding who would have responsibility for building interconnection facilities; delays in LUMA’s request for proposal (RFP) process for the work related to interconnections; and permitting delays with Puerto Rican government agencies, among other hurdles.<sup>52</sup> No explanation has been offered by any party for the delays in subsequent tranches.

In addition to the delays, the prices for the Tranche 1 projects rose substantially from when the projects were originally reviewed by the FOMB in March 2022 to when they were finally approved by the FOMB in September 2023. The FOMB noted that prices had gone up an average of 34%. The cost increases were related to inflation and to the cost of interconnection with LUMA, given that the interconnection studies had not been completed as of March 2022 when the projects were first reviewed. While inflation was relatively high during this period, the FOMB noted that prices of comparable projects in the United States had increased by 23%—significantly less than the inflation of the Tranche 1 contract costs. In its approval, the FOMB required the projects to seek financing from the DOE’s Loan Program Office and, if successful in securing financing, pass all savings along to ratepayers.<sup>53</sup>

The average levelized cost of the solar projects is 13.3 cents/kWh (although it should be noted that since many of these projects also contain battery storage, it is not possible to do an apples-to-apples comparison with pure solar projects).<sup>54</sup> IEEFA was only able to obtain public information on the individual contract costs of two of the projects, both of which are pure solar projects: The Clean Flexible Energy Salinas project (120 MW of solar, no storage), which starts at 9.249 cents/kWh and escalates at 2% per year, and the Ciro One project (140 MW of solar, no storage), which starts at 9.9 cents/kWh.<sup>55</sup> These prices are significantly more than prices for solar farms of comparable size in the United States,<sup>56</sup> but also much less than the average cost of fossil fuel generation in Puerto Rico at 17 cents/kWh.<sup>57</sup>

In August 2023, several Puerto Rican organizations sued the Puerto Rico Energy Bureau, Planning Board, Department of Commerce and Economic Development, and Office of Permit Management over the siting of the projects. According to an expert report submitted as part of the lawsuit, 78% of the acreage where Tranche 1 projects are slated to be built is designated as agricultural land by the

<sup>51</sup> Accion Group. [PREB Tranche 3: Announcements](#). Last visited May 30, 2024; Accion Group. [PREB Tranche 2: Announcements](#). Last visited May 30, 2024.

<sup>52</sup> FOMB letter to PREPA. [Re: Tranche 1 RFP PPOAs](#). September 14, 2023.

<sup>53</sup> [Ibid.](#)

<sup>54</sup> [Ibid.](#)

<sup>55</sup> FOMB letter to PREPA. [Re: CIRO One Salinas, LLC](#). January 18, 2024.

<sup>56</sup> Recent solar-only PPA prices in the United States outside of Hawaii and California are approximately 3–4 cents/kWh. See: Lawrence Berkeley National Laboratory. [Utility-Scale Solar: 2023 Edition](#). October 2023.

<sup>57</sup> FOMB. [FY 2023 Certified Fiscal Plan](#), p. 40.

Puerto Rico Land Use Plan.<sup>58</sup> Under Puerto Rico law, the land needs to be protected for agricultural uses. As of May 2024, the matter was pending before the Puerto Rico Supreme Court. The National Renewable Energy Laboratory found in the PR100 study that there is technical potential for 14 gigawatts of utility-scale solar on land use categories that are not part of the lawsuit (i.e., eliminating protected agricultural and ecological lands from consideration).<sup>59</sup>

## Lessons Learned: Utility-Scale Solar

The lack of transparency in the procurement process makes it difficult to fully understand the excessive delays and cost overruns in the procurement of utility-scale solar. While inflation in construction costs in 2023 certainly contributed to the increase in contract prices, it is not sufficient to explain a 34% increase. This mismanagement of the utility-scale solar contracting process undermines fiscal stability as well as confidence in the Energy Bureau and the FOMB's regulatory and oversight roles.

Additionally, land use restrictions have not yet been part of the considerations in the utility-scale solar RFP process, resulting in significant community opposition to some projects. To date, the Puerto Rico Energy Bureau has not engaged in a planning process related to the siting of utility-scale solar resources, and no consideration has been given to prioritizing solar on abandoned landfills, brownfields and other degraded lands in Puerto Rico, although prioritization of such sites would reduce community opposition.<sup>60</sup>

The failure to move forward in an efficient manner with solar procurements is a continuation of long-standing problems with electrical system contracting. Before the electrical system was privatized via the LUMA and Genera contracts, IEEFA had recommended the implementation of an Independent Private Sector Inspector General (IPSIG) at PREPA. An IPSIG would have powers of monitoring, auditing and investigation to refer corrupt and illegal conduct to proper law enforcement authorities, and to design and implement programs to prevent waste, fraud and abuse.<sup>61</sup> This recommendation was not implemented, and electrical system contracting continues to be a major problem, with both the LUMA and Genera contracts reflecting continued politically driven contracting.

The IPSIG model could be used in a more surgical manner and applied to the goal of increasing renewable energy deployment, starting with a transparent analysis of the problems with the utility-scale solar contracting to date.

<sup>58</sup> Pedro Cardona Roig. Informe de análisis de la ubicación de 17 proyectos de generación y almacenamiento de energía y sus posibles impactos en suelos con distintos niveles de protección y riesgo. August 11, 2023.

<sup>59</sup> DOE. [PR100 Study](#). April 2024, p. 85.

<sup>60</sup> An EPA screening tool suggests 1000 MW of solar potential on such sites, considering only sites greater than 14 acres within one mile of a transmission line on the main island of Puerto Rico. Potential increases to 1600 MW if the island of Vieques is included. See: EPA. [RE-Powering Americas land](#). March 20, 2024.

<sup>61</sup> [UTIER Objection to Insurers' Motion for Relief from Automatic Stay \(Dkt #975\) and to Pray for the Appointment of an Independent Private Sector Inspector General \(IPSIG\)](#). United States Federal Court for the District of Puerto Rico Case No. 17-04780-LTS, Dkt #1158. March 29, 2019.

## Conclusion and Recommendations

Puerto Rico's renewable energy transformation is well under way, although it is entirely taking place at the level of individual households and businesses installing rooftop solar and storage. Renewable energy generation in Puerto Rico is now 9%, up from 2% to 3% before Hurricane Maria in 2017.

One of the most significant long-term threats to this transformation is the presence of New Fortress Energy's subsidiary Genera PR as the operator of Puerto Rico's power plants. New Fortress has publicly stated that its goal is for the future of Puerto Rico's electrical system to be natural gas, "supplemented" by solar and storage.<sup>62</sup> This statement blatantly contradicts the island's public policy of a transition to 100% renewable energy. The most significant action that the government of Puerto Rico could take to signal its commitment to its own energy public policy would be the cancellation of the Genera contract.

IEEFA makes the following additional recommendations to support the continued rapid growth of distributed generation:

- The FOMB should allow the new Puerto Rico law to stand, extending net metering through 2030.
- The FOMB needs to consider several future forecasts of rooftop solar growth in its next fiscal plan to analyze and plan for the budgetary implications of different growth trajectories.
- Future federally funded programs should specifically target the most vulnerable households, as the DOE is currently seeking to do, and they should support standardized and smaller systems to stretch federal dollars farther.
- The Puerto Rico Energy Bureau needs to track and publish metrics related to voltage stability at the distribution system level.
- LUMA and the Energy Bureau should publish up-to-date information on the hosting capacity of the distribution system and prioritize increasing hosting capacity where needed, ideally with available federal funds. Customers should not be responsible for paying for distribution system upgrades needed to integrate additional rooftop solar.

In contrast to the rapid growth of distributed generation, utility-scale generation has not increased at all since Hurricane Maria. Due to the significant delays in the utility-scaled solar procurement schedule, Puerto Rico clearly will not meet its statutory mandate of 40% renewable energy by 2025. IEEFA makes the following recommendations:

- The Energy Bureau should carry out a planning process with ample community participation for the siting of future utility-scale renewable energy projects. All future procurement tranches need to exclude protected agricultural lands and instead prioritize landfills, brownfields and degraded lands.

---

<sup>62</sup> New Fortress Energy. [Q1 2024 Earnings Call](#), May 8, 2024.

- An IPSIG should be created to investigate the delays and cost overruns in the Tranche 1 procurement schedule and to make transparent and public recommendations for current and future tranches.

Puerto Rico's political, fiscal and utility regulatory process has mapped out a plan that properly aligns the urgent need for resiliency for residents with the cost savings potential of renewable energy needed to balance its budget and to promote economic growth. These policies are codified in law, ordered by its utility regulator and certified by its federal budget oversight board. Yet the commonwealth's utility operator Genera and the FOMB are supporting expensive and price-volatile natural gas generation. The FOMB's latest efforts to undermine rooftop solar are an example of poor management and poor planning that could dramatically slow the one area in which real progress has been made to improve resiliency and expand renewable energy in Puerto Rico.

## About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

## About the Authors

### Tom Sanzillo

Tom Sanzillo, director of financial analysis for IEEFA, is the author of numerous studies on the oil, gas, petrochemical and coal sectors in the U.S. and internationally, including company and credit analyses, facility development, oil and gas reserves, stock and commodity market analysis and public and private financial structures. Sanzillo has experience in public policy and has testified as an expert witness, taught energy industry finance and is quoted frequently in the media. He has 17 years of experience with the City and the State of New York in senior financial and policy management positions. As the first deputy comptroller for the State of New York Sanzillo oversaw the finances of 1,300 units of local government, the annual management of 44,000 government contracts, and over \$200 billion in state and local municipal bond programs as well as a \$156 billion global pension fund.

### Cathy Kunkel

Cathy Kunkel is an Energy Consultant at IEEFA. Cathy also served as an Energy Finance Analyst at IEEFA for 7 years, researching Appalachian natural gas pipelines and drilling; electric utility mergers, rates and resource planning; energy efficiency; and Puerto Rico's electrical system. She has degrees in physics from Princeton and Cambridge.

This report is for information and educational purposes only. The Institute for Energy Economics and Financial Analysis ("IEEFA") does not provide tax, legal, investment, financial product or accounting advice. This report is not intended to provide, and should not be relied on for, tax, legal, investment, financial product or accounting advice. Nothing in this report is intended as investment or financial product advice, as an offer or solicitation of an offer to buy or sell, or as a recommendation, opinion, endorsement, or sponsorship of any financial product, class of financial products, security, company, or fund. IEEFA is not responsible for any investment or other decision made by you. You are responsible for your own investment research and investment decisions. This report is not meant as a general guide to investing, nor as a source of any specific or general recommendation or opinion in relation to any financial products. Unless attributed to others, any opinions expressed are our current opinions only. Certain information presented may have been provided by third parties. IEEFA believes that such third-party information is reliable, and has checked public records to verify it where possible, but does not guarantee its accuracy, timeliness or completeness; and it is subject to change without notice.

